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MBMS Support in UTRAN

BACKGROUND OF THE INVENTION

MBMS (Multimedia Broadcast and Multicast Services) is currently being standardised in 3GPP. However, no real discussion took ever place regarding how to support the establishment of an MBMS session with regards to the UTRAN and in particular the Iur-interface.

The requirements for the MBMS Service Architecture are described in 3GPP TS 22.146 V.5.2.0 dated March 2002.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a multicast group with user equipments that are controlled by different RNCs/SGSNs.

Figure 2 shows a separation of the Iu control plane and user plane as suggested by the present invention.

Figures 3a and 3b show the necessary signalling between SRNC and DRNC to implement this separation.

DESCRIPTION OF THE INVENTION

It is a basic concept in MBMS that the MBMS content is going to be delivered per multicast group members located in the area controlled by a certain RNC and not per UE.

On the other hand, when it comes to the 'mapping' of this concept to the actual signalling and the currently adopted concepts in the UTRAN there are different possibilities.

Within the UTRAN an RNC can take up different roles, e.g. as a Serving Radio Network Controller (SRNC), a Drift Radio Network Controller (DRNC), or a Controlling Radio Network Controller (CRNC). This has consequences on the MBMS architecture, which have hitherto not being considered as it is only presumed that the MBMS content is generically delivered to an RNC.

In particular, when assuming a scenario where the Iur-interface is present and the MBMS session is going to take place in a cell controlled by the DRNC there will be a certain number of user equipments (UE) in that cell belonging to a multicast group interested in that MBMS 'delivery', some of which have the CRNC as SRNC and some of which are controlled by one or more SRNCs that are different from the CRNC. This situation is described in figure 1.

In the scenario as shown in figure 1, there are two options when it comes to the delivery of MBMS content to RNC2:

It is a first option that the content is delivered, i.e. the Iu user plane for MBMS is established, towards RNC2 directly. In this case we can say that for MBMS the Serving GPRS Support Node (SGSN) is always connected to the CRNC.

It is another option that the user plane for MBMS is established on an individual basis via the SRNC of each member of the multicast group. This case would imply that there are MBMS user planes over the Iur interface.

It can be seen that with the second option there would be multiple unsynchronised flows for the same MBMS session reaching RNC2, which is not desirable. For this reason it is believed beneficial that the MBMS content is delivered to the CRNC. Each SRNC would still receive MBMS RAB assignments from the relevant CN node for the MC group members it is in charge of via the ordinary Iu interface as only the SRNC is

fully aware of its own UEs, but the MBMS RAB will possibly logically be associated with a user plane which is established towards another RNC.

On the other hand we should consider the case that, for example, UE1 is the only MBMS multicast group member in the cell for a certain session. Then, it would be beneficial to use dedicated resources for this UE. In this case it would also be better to have the content delivered over Iur as today, with all the gains from the possibility, e.g., to make a soft handover, to gain capacity, etc.

Then with this approach, when the common MBMS resource becomes available in the cell, e.g. when many multicast group members enter the cell, the DRNC would indicate that to the SRNC, which may choose to move the UE to that resource.

Thus, it has been observed to be a problem that there is currently no standardised mechanism within the UTRAN to attach the users to a MBMS session when the Iur interface is present. In addition to this it has never been considered that it could be beneficial to deliver the MBMS content to the CRNC instead of the SRNC.

It is an object of the present invention to avoid multiple unsynchronised flows for the same MBMS session reaching the CRNC when there are multiple MBMS users, which are controlled by different RNCs, in the same session and in the same cell. The solution according to the present invention is that in this case the Iu user plane delivering MBMS data is established towards the CRNC and not the SRNC.

With this invention, the CRNC will initiate the establishment of the Iu user plane carrying MBMS data when there are sufficient users for that MBMS multicast session in cells under its control. The detailed signalling over the Iu interface is for further study, but the figure 2

describes the principles, i.e. the separate control and user planes could also be towards different Serving GPRS Support Nodes.

More over, in case for radio efficiency purposes, dedicated resources are to be used in the DRNC/CRNC controlled cell for users belonging to other RNCs, a solution is that in this case, the MBMS content is delivered via Iur as of today for ordinary dedicated channels.

With the assumptions above described, it can be seen that new mechanisms are required over the Iur-interface in order to enable the user equipments that are controlled by an RNC that is different from the one controlling the MBMS cell to join a certain session.

In particular, there is a need to transfer the MBMS RAB information coming from the CN to the DRNC, i.e. the CRNC for the MBMS cell, so that the DRNC can attach such an UE to the MBMS session. The DRNC should then return to the SRNC the information on the actual resources allocated to the UE.

If these resources are common, the DRNC would already have or has to establish an Iu user plane for MBMS and there should be an indication that no MBMS content needs to be delivered to the SRNC.

This invention proposes a new set of elementary procedure for the RNSAP protocol, called Multicast Attach and Multicast Detach.

The name of this procedure should be seen as a possibility, however, embodiements of the present invention can be considered any procedures enabling the below described mechanisms.

The procedure is started from the SRNC by issuing a MULTICAST ATTACH REQUEST message and the successuful outcome

message is sent back from the DRNC by means of MULTICAST ATTACH RESPONSE as seen in figure 3a.

In the request message the SRNC, become aware that the UE wants to join a certain MBMS session in a cell in the DRNS, is requesting the DRNC to attach the user to that session.

At this point the decision of using dedicated or common resources is not made yet. In the Multicast Attach Request message the SRNC will both relay RAB establishment-related information coming from the Core Network and information similar to what is currently included in the Radio Link Setup/Addition Request message in case dedicated resources are to be established for this UE. The SRNC is not aware if this is going to happen, it is a DRNC decision. It could also be possible to include in this message a flag where the SRNC indicates its willingness to move the UE to common resources when the DRNC becomes aware that common resources are more appropriate for this MBMS session. The relevant MBMS session identifier to attach the UE to is also included in the request message.

Once the DRNC receives this information, and being aware of how many users are bound for that MBMS session in that cell, it can decides whether to allocate dedicated resources to this user or not. If it decides so, the DRNC will establish the relevant resources and return a MULTICAST ATTACH RESPONSE message which in this case would be basically analogous to the Radio Link Setup/Addition Response message.

If the DRNC decides to allocate common resources - and the SRNC was willing to allow that UE on common resources - it will establish an Iu user plane towards the appropriate SGSN (in this case it is likely that an Iu user plane for the MBMS session already exists) and return the MULTICAST ATTACH RESPONSE message containing the information about the established common resources and Iu user plane, so that the

SRNC is informed that the MBMS data for this user is being delivered via the DRNC. If the procedure was not successful, the DRNC shall include relevant information, e.g. cause values, etc.., in a MULTICAST ATTACH FAILURE message.

In order to enable the SRNC to remove the UE from the session a corresponding MC DETACH procedure can be used. Details are for further study.

When channel switching from dedicated to common resources is to be performed, the DRNC can indicate (knowing from the MC Attach procedure that this UE can be moved to common resources) the need for a switch to the SRNC in a appropriate message MBMS INFORMATION TRANSFER INDICATION (that could be used to relay also other MBMS related control information needed at the SRNC), as shown in figure 3b.

The possibility of performing the Multicast Attach and MBMS Information Transfer per pools of UEs controlled by the same SRNC to reduce signalling over Iur is a possible option.

It would also be possible to feedback MBMS information via the already specified Information Exchange procedures. In this case the feedback exchange cannot be initiated by the DRNC autonomously, though, therefore this would apply to background MBMS data retrieval more than to scenarios like channel switching.

The present invention provides the following advantages:

The Iu MBMS user planes are established where needed and in case of common resources being allocated for several members of a multicast group receiving data in the same cell the presence of multiple unsynchronised flows for the same MBMS session is avoided.

It is another advantage that the invention introduces the needed mechanisms in the RNSAP protocol to enable users

controlled by a RNC different from the CRNC (Iur scenarios) to participate in a MBMS multicast session.

It is yet another advantage that the invention evolves the current UTRAN architecture in a backwards compatible way and maintains the current handling in case of dedicated resources.

It is still another advantage of the invention to introduce a new procedure (MBMS Information Transfer) to enable the signalling of MBMS information feedback between two RNCs connected via a Iur interface.

The present invention claims a separation of the MBMS Iu control and user plane and related concepts and possible RANAP and/or other new or existing protocol signalling;

It claims further Multicast Attach, Multicast Detach and MBMS Information Transfer procedures and related concepts or any differently named Iur procedures realising the above described mechanisms.

The present invention also claims the possibility of relaying MBMS related feedback (new Information Elements) via the already specified Information Exchange procedures (if MBMS Information Transfer or similar procedure is not adopted.

The present invention as described above targets the Multicast Mode of MBMS; however, after due modifications, these concepts could also be applicable for the Broadcast Mode of MBMS.

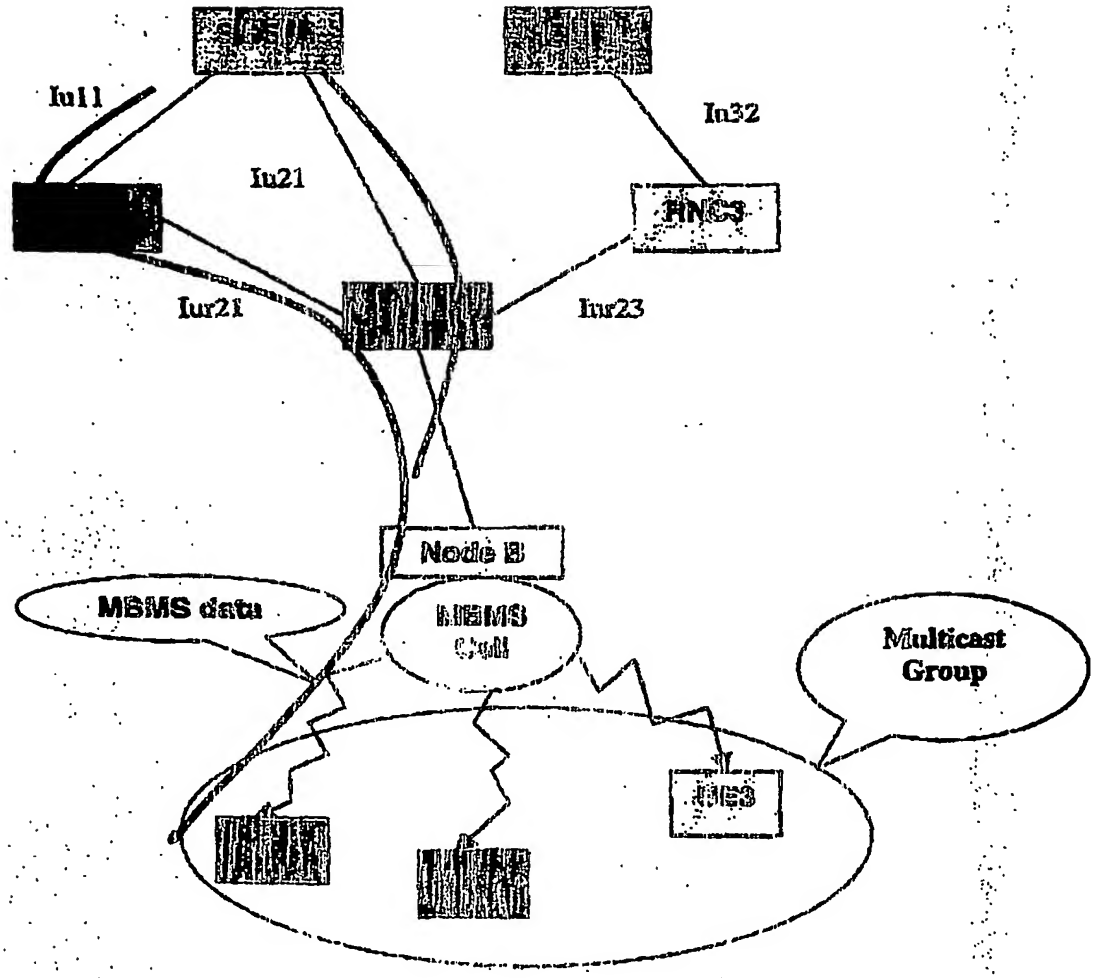

Fig. 1

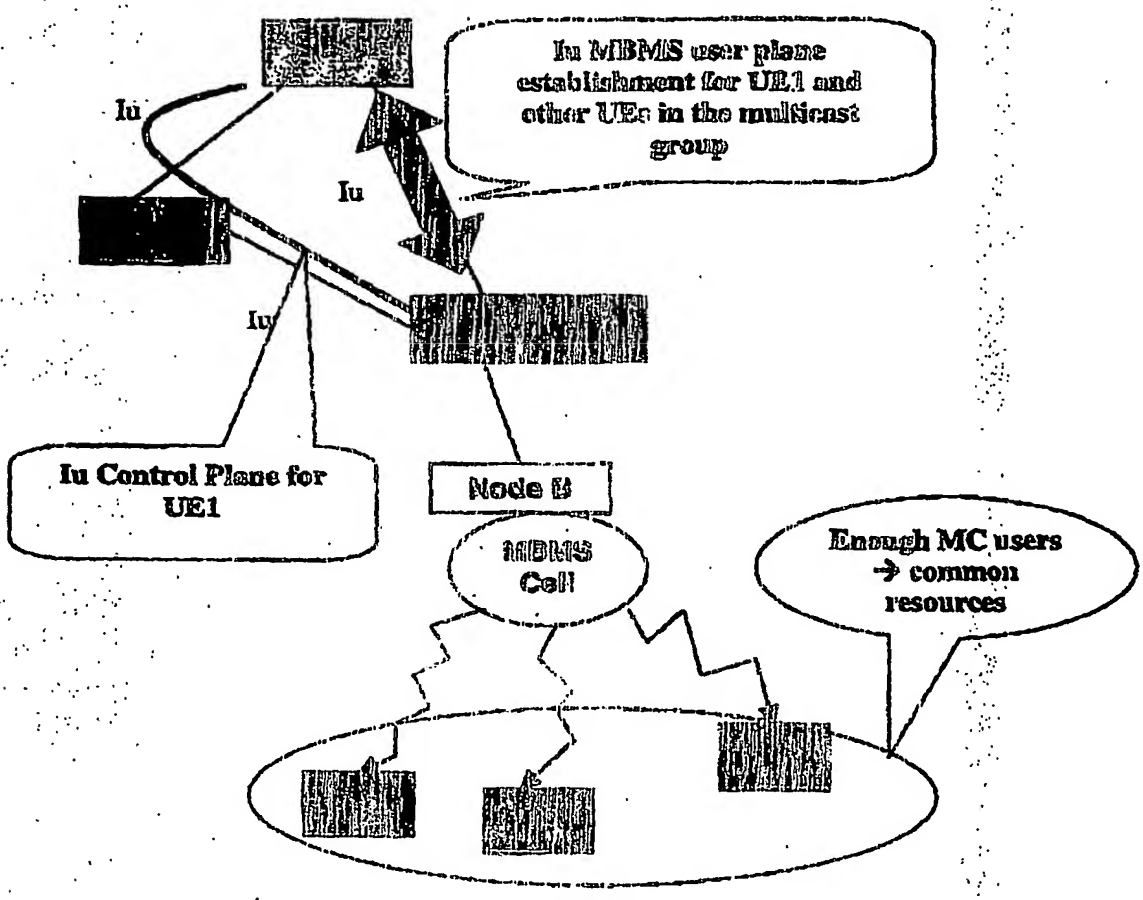

Fig. 2

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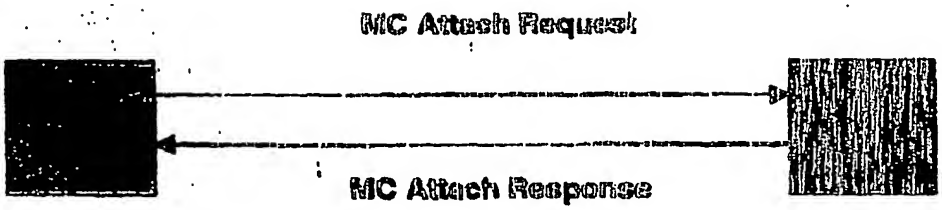

Fig. 3a

Fig. 3b